

REMARKS

This is in response to the Office Action mailed March 12, 2003. Applicant respectfully traverses and request reconsideration.

Applicants respectfully submit, for the Examiner's consideration, amended claims 1, 8, 16, 17, 21 and 23. It is respectfully submitted that these amendments are not narrowing in nature nor are they directly related to patentability, but rather are a further delineation of inherently contained features previously contained herein. Should the Examiner feel that these amendments are narrowing or related to patentability, Applicants request a statement by the Examiner asserting this position.

Objections

Claim 9 stands objected to based on a noted informality. Due to inconsistencies with the electronic filing of this application, the phrase "8wherein" has been amended as "8 wherein." As such, Applicant requests withdrawal of the present objection.

Claims 9-10, 16-17, 20 and 23 stand rejected under 35 U.S.C. §112, ¶ 2 as being indefinite. The Examiner asserts confusion regarding the claimed limitation "when heat having a temperature greater than or equal to a first melting temperature, but less than the second melting temperature, is applied to the solder ball array, only the plurality of first solder balls are melted." Applicants appreciate the Examiner-noted confusion and respectfully submit herein amendments to claims 9, 16, 20 and 23 to obviate the Examiner-noted confusion. These claims, as originally claimed, provide for a heat, the heat having a temperature greater than or equal to the first melting temperature and less than the second melting temperature, wherein the heat is applied to the solder ball array. For example, in FIG. 11, step 162, a heat having a temperature greater than or equal to the first melting temperature but less than the second melting temperature is applied to the carrier substrate in the printed circuit board. As such, it is respectfully submitted the rejection is no longer proper and withdrawal is respectfully requested.

Claims 16 and 17 currently stand rejected based on confusion regarding specific claim limitations. Applicant respectfully submits amended claims 16 and 17 to obviate confusion

regarding the claim limitations of the top surface and the bottom surface in claim 16 and the minimum distance in claim 17. As such, reconsideration and withdrawal is requested.

Rejection Under 35 U.S.C. §103(a)

Claims 1-26 currently stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,796,169 (“Dockerty”). Applicant respectfully traverses and requests reconsideration.

As understood, Dockerty is directed to, *inter alia*, a structurally reinforced ball grid array semiconductor package having a plurality of solder balls 11 disposed relative to solder paste 12 between a printed circuit board 1 and an integrated circuit device 3. Dockerty discloses utilizing solder balls 11 in conjunction with solder supports 16 and 18 having similar circumferential shapes but tubularly extending on the printed circuit board for allowing a larger surface contact area.

The present invention is directed to, *inter alia*, the solder ball collapse control system having a plurality of solder members, wherein in one embodiment the solder members are solder balls, having varying dimensions and varying melting temperatures. The solder members are disposed on a carrier substrate and based on the application of the soldering heat having a temperature between the melting temperatures of the different soldering material, a first set of solder members melt, wherein the second set of solder members do not. The second set of solder members thereupon provide for spacing between various soldered elements, such as in one embodiment a printed circuit board and a carrier substrate.

Claims 8-20 and 23-26

Specifically regarding claims 8, 15 and 23, these claims recite, *inter alia*, “a plurality of first solder balls...; and a plurality of second solder balls.” Dockerty discloses solder balls 11 and solder paste 12, which is inconsistent with the claimed limitations of plurality of first solder balls and plurality of second solder balls. Looking more specifically at FIG. 1 of Dockerty, the solder paste 12 are not balls and is specifically disclosed as being “screen deposited onto contacts 2 and 8 before integrated circuit device 3 is positioned, paste 12 being composed of resin and low melting temperature 37/63 lead/tin type solder. Solder balls 11 and column 6 are

pressed into paste 12.” (see col. 10, lines 60-64). Therefore, it is respectfully submitted that Dockerty fails to teach or suggest, *inter alia*, the claimed plurality of first solder balls and claimed plurality of second solder balls as asserted by the Examiner in the present Office Action. Moreover, Applicant respectfully request a showing, including column and line numbers, of where Dockerty explicitly discloses the claimed plurality of first solder balls and the plurality of second solder balls in accordance with the claimed present invention. Otherwise, Applicant requests reconsideration and withdrawal of the present rejection.

Claims 1 and 21

Specifically regarding claims 1 and 21, Applicant respectfully submits amended claims 1 and 21 providing for the solder members to be “disposed thereon with a solder dispensing machine.” In the present Office Action, the Examiner asserts that the originally presented limitation of the member being “capable of being dispensed” is not a positive limitation, citing In re Hutchinson, 69 U.S.P.Q. 138. Applicant traverses the Examiner’s assertion that this claimed limitation, as originally presented, is not a positive limitation, but regardless thereof respectfully submits amended claims 1 and 21 for consideration. It is submitted that in accordance with MPEP §2173.05(g) that the claimed limitation of “disposed thereon with a solder dispensing machine,” provides definite boundaries on the patent protection sought. In re Barr, 444F.2d 588, 170 U.S.P.Q. 33 (CCPA 1971).

Applicant submits that Dockerty fails to teach or suggest the asserted first solder member and the second members disposed on the printed circuit board 1 and/or the device 3 with a solder dispensing machine. Moreover, it is submitted that the Examiner-asserted solder paste 12, as disclosing the second members, is improper because, *inter alia*, FIGS. 1 and 2 on the accompanying disclosure illustrate the paste as being amorphous area onto which the solder ball 11 and the support solder 6 are inserted therein. It is submitted that Dockerty fails to teach or suggest, *inter alia*, the first solder members disposed on a carrier substrate with the solder dispensing machine and the plurality of second members disposed thereon with a solder dispensing machine. Should the Examiner maintain the present rejection, Applicant requests a showing, including column and line numbers, of where Dockerty teaches or suggests the solder

balls 11 and solder paste 12 being dispensed on the carrier substrate using the solder dispensing machine.

It is further submitted that Dockerty fails to teach or suggest, *inter alia*, the first solder members disposed in the carrier substrate, wherein the Examiner has asserted that the first solder members are disclosed by the solder balls 11 and the carrier substrate is the printed circuit board 1. FIG. 1 in the accompanying disclosure clearly and succinctly illustrates that the solder ball 11 is disposed on the paste 12, wherein it is submitted this is inconsistent with the claimed present invention.

As such, Applicant requests reconsideration and withdrawal.

Claims 2-7, 9-14, 16-20, 22 and 24-26

Regarding claims 2-3, 9-10 and 22, Applicant respectfully resubmits the above position offered with regard to claims 1, 8 and 21, respectively. It is further submitted that these claims contain further patentable subject matter and are allowable, not merely as being dependent upon an allowable base claim. As such, reconsideration and withdrawal is respectfully requested.

Regarding claims 4, 11, 16-17 and 24, Applicant submits these claims contain further patentable subject matter and resubmits the above position offered with regard to claims 1, 8, 15 and 23. Furthermore, these claims recite limitations regarding to a dimension disposed between the printed circuit board and the integrated circuit as defined by the second members, or second solder balls. It is submitted that Dockerty teaches, *inter alia*, the air gap or minimum distance defined between the printed circuit board and the device as not defined by the solder paste, but rather is defined by the combination of expansion based on the heating of the solder paste. As such, it is respectfully submitted that these claims contain further patentable subject and are allowable not merely as being dependent upon an allowable base claim. Reconsideration and withdrawal is respectfully requested.

Regarding claims 5, 12, 18 and 25, Applicant resubmits the above position offered with regard to claims 1, 12, 15 and 23. Moreover, it is submitted these claims recite limitations including "at least one heat sink disposed on a top surface of the carrier substrate." In the present Office Action, the Examiner provides that the heat sink 27 is disposed on the substrate

24, where it is respectfully submitted that Dockerty actually teaches the heat sink disposed on the chip or cap 26, which is inconsistent with the claimed present invention. As such, it is submitted that these claims contain further patentable subject matter and are patentable not merely as being dependent upon an allowable base claim. Reconsideration and withdrawal is respectfully requested.

Regarding claims 6, 13-14, 19-20 and 26, Applicant respectfully resubmits the above position offered with regard to claims 1, 8, 15 and 23 and submits these claims contain further patentable subject matter in view thereof. Among other things, these claims recite limitations to the second members and solder members having an outer layer of solder material having the first melting temperature. On page 6 of the present Office Action, the Examiner asserts that the second members 11 include an outer layer of a solder material, first material having the first melting temperature, to which Applicant respectfully disagrees. Column 3 of Dockerty succinctly discloses that the solder balls 12 are composed of a 90/10 lead/tin high melting temperature solder and that the paste is composed of a resin and low temperature 37/63 lead/tin type solder. It is submitted that this is inconsistent with the claimed present invention. Should the Examiner maintain the present rejection, Applicant requests a showing indicating where Dockerty explicitly discloses the claimed second member and second solder balls having an outer layer consistent with the first temperature relative to the first solder member and first solder balls. Otherwise, Applicant requests reconsideration and withdrawal.

Accordingly, Applicant respectfully submits that the claims are in condition for allowance and that a timely Notice of Allowance be issued in this case. The Examiner is invited to contact the below-listed attorney if the Examiner believes that a telephone conference will advance the prosecution of this application.

Date: June 5, 2003

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Respectfully submitted,

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